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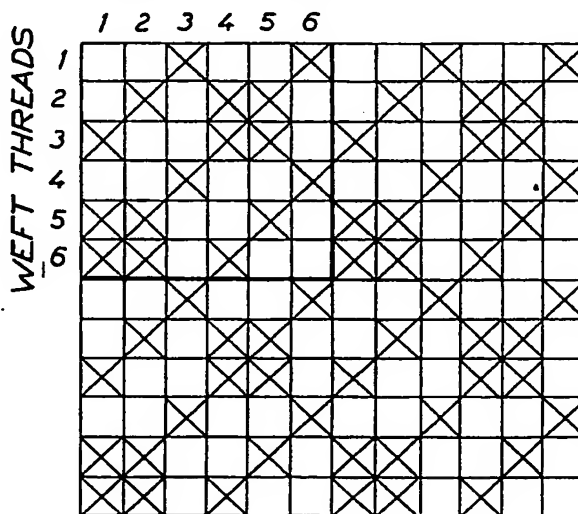
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(71) Applicant: **ALMEDAHL AB, Box 17, S-510 50 Dalsjöfors (SE)**(43) Date of publication of application: 29.10.80
Bulletin 80/22(72) Inventor: **Ahlström, Sten, Risbovägen 9, S-510 50 Dalsjöfors (SE)**
Inventor: **Zscherp, Rudolf, Tummarpsvägen 6, S-510 50 Dalsjöfors (SE)**(84) Designated Contracting States: **AT BE CH DE FR GB NL**(74) Representative: **Wallin, John Erik et al, AWAPATENT AB Box 5117, S-200 71 Malmö (SE)**(54) **Cloth of high tensile and tearing strength.**

(57) A cloth with balanced strength properties in the warp and weft directions comprises a plastics- or elastomercoated ground fabric of multi-fibre, approximately equally coarse threads which are interwoven with approximately the same set of warp and weft according to a weave pattern the repeat of which comprises six warp threads and six weft threads, the first and fourth weft threads passing over the first, second, fourth and fifth warp threads, the second weft thread passing over the first, third and sixth warp threads, the third weft thread passing over the second, third and sixth warp threads, the fifth weft thread passing over the third, fourth and sixth warp threads, and the sixth weft thread passing over the third, fifth and sixth warp threads.

WARP THREADS

CLOTH OF HIGH TENSILE AND TEARING STRENGTH

A cloth of high tensile and tearing strength is often used for technical purposes, such as tarpaulins, canopies, air-inflated structures and the like but also for many other products. Such a cloth comprises a ground fabric of multi-fibre, approximately equally coarse threads of poly-
5 amide, polyester or other synthetic material of high tensile strength, which are interwoven with approximately the same set of warp and weft, the finished ground fabric being coated with a plastics or elastomer material, such
10 as polyvinylchloride, polyurethane or a polymer of 2-chlorobutadiene. It is desired, with a given fabric weight per surface area, to obtain optimum strength properties of the coated fabric. To attain optimum strength properties it is essential to reach a balance of the tensile strengths in
15 the warp and weft directions and at the same time a balance of the tearing strengths over warp and weft.

Generally, there is no problem in balancing the tensile strengths in the warp and weft directions. With the same yarn thickness for warp and weft said tensile
20 strengths in fact are largely equally high, using the same set of warp and weft. Certainly, the weft mostly is slightly weaker but this difference is principally marginal and, if desired, can readily be balanced by a slight increase of the set of weft. It is considered that the
25 somewhat lower tensile strength of the weft is due to the weft threads not lying quite as straight as the warp threads in the fabric. When being tested as well as in practical use the thread systems will therefore be placed under non-uniform load, resulting in a lower tensile
30 strength in the weft direction.

A more complex problem is encountered with regard to the balancing of the tearing strengths over warp and weft. Starting from a plain cloth with 2 ends and fully symmetrical setting, the tearing strength over the weft will
35 usually be only about 60% of the value of the tearing

strength over the warp. The explanation is that in the coating operation the coating material is urged in between the individual fibres in the weft yarn to a much greater extent than in the warp yarn. As a result, the weft yarn
5 becomes stiffer and the tearing strength drastically decreases.

To compensate for this, one has in many cases turned to using a simple double-faced warp rib. It has thus been possible largely to triple the tearing strength over the
10 weft, but at the same time the tearing strength over the warp decreased by about 20%, making the cloth still unbalanced.

Going the whole way and reinforcing the warp in the same manner, one will obtain a 2/2 dice weave. It has,
15 however, been found that one must at the same time increase the set of both warp and weft by about 33% in order that the fabric shall permit being handled without any thread displacements. Now, the same thing happens again, i.e. the tearing strength over the warp triples whereas the
20 tearing strength over the weft decreases by about 20%.

The object of the present invention is to eliminate the above-described problems encountered in providing balanced optimum strength properties in a cloth intended for technical purposes, such as tarpaulins, canopies, and
25 the like, of the type indicated in the preamble of the appendant claim. This object has been realized in that the threads are interwoven in a weave pattern the repeat of which comprises six warp threads and six weft threads, the first and fourth weft threads passing over the first, second, fourth and fifth warp threads, the second weft
30 thread passing over the first, third and sixth warp threads, the third weft thread passing over the second, third and sixth warp threads, the fifth weft thread passing over the third, fourth and sixth warp threads, and the
35 sixth weft thread passing over the third, fifth and sixth warp threads.

The invention is based on the observation that it is possible, in connection with the plastics coating of

ground fabrics, to attain balanced strength properties in the finished cloth by using for the manufacture of the ground fabric of the cloth a weave pattern that has been especially designed for the purpose. Said weave pattern is illustrated in the accompanying drawing. Each small square of the drawing corresponds to a point of cross-over of a warp thread and a weft thread, every horizontal row of squares thus corresponding to a weft thread and every vertical row of squares corresponding to a warp thread. The crossed squares indicate that the warp thread at the respective cross-over point passes over the weft thread, while every empty square implies that the weft thread at the respective cross-over point passes over the warp thread. At the upper left of the drawing figure, thicker lines define a square comprising six warp threads and six weft threads. This is the pattern repeat for the weave pattern in question. The portion of the fabric pattern illustrated in the drawing comprises four pattern repeats for a clear showing of the nature of the pattern.

20 The repeat of the weave pattern illustrated in the drawing comprises, as mentioned above, six warp threads and six weft threads. The first and fourth weft threads pass over the first, second, fourth and fifth warp threads, the second weft thread passes over the first, third and sixth warp threads, the third weft thread passes over the second, third and sixth warp threads, the fifth weft thread passes over the third, fourth and sixth warp threads, and the sixth weft thread passes over the third, fifth and sixth warp threads.

30 Cloths having a ground fabric of the 2-end type, warp-rib type, 2/2 dice type and a ground fabric with a weave pattern according to the present invention were manufactured for illustration of the effect of the invention. The same yarn was employed for all ground fabrics, and the yarn was used for both the warp and the weft of the fabrics. The different ground fabrics were then coated with a plastics coat of the same kind and in the same manner, after which the finished cloths were subjected to

tensile strength tests (5 cm wide strips) in both the warp and the weft direction as well as to tearing tests over both the warp and the weft. The results will appear from the following Table.

Weave	<u>Coated fabric</u> →					Thickness uncoated fabric mm	Ends per cm
	Grammage	Tensile		Tearing			
	uncoated	strength		strength			
	fabric	N per 5 cm		N over			
	g per m ²	warp	weft	warp	weft		
2 ends	185	3000	2800	450	250	0.25	9 x 9
Warp rib	185	3000	2800	350	800	0.27	9 x 9
2/2 dice	230	4000	3700	1000	600	0.34	12 x 12
Invention	185	3000	2800	700	650	0.27	9 x 9

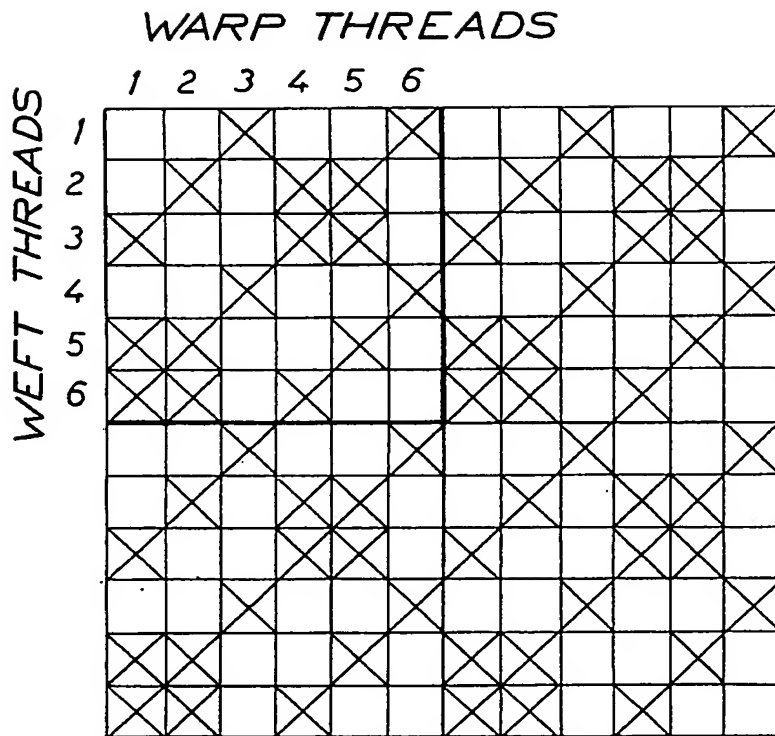
The Table shows that the cloth according to the invention had equally good and balanced tensile strengths in the warp and weft directions as the cloths having a weave with 2 ends and warp rib, but the tearing strengths over warp and weft were practically the same and substantially higher (approximately 100% or more) than the tearing strength in the poorest direction for the said two other cloths, simultaneously as the grammage and thickness of uncoated fabric and the set were practically the same in the three cases. With regard to the cloth having a ground fabric of 2/2 dice weave it should be observed that the tensile strengths and the tearing strength over the warp certainly were higher than for the cloth according to the invention, but the tearing strength over the weft was somewhat lower. Besides, it should be taken into consideration that the cloth of 2/2 dice weave, for the reasons earlier indicated, had to be woven with a substantially higher set and, consequently, substantially higher grammage and thickness for untreated fabric. Thus the cloth having a 2/2 dice weave was much more expensive to manufacture and had a substantially unbalanced tearing strength over warp and weft.

CLAIM

Cloth of high tensile and tearing strength comprising a plastics- or elastomer-coated ground fabric of multi-fibre, approximately equally coarse threads which are interwoven with approximately the same set of warp and weft, c h a r-
5 a c t e r i s e d in that the threads are interwoven in a weave pattern the repeat of which comprises six warp threads and six weft threads, the first and fourth weft threads passing over the first, second, fourth and fifth warp threads, the second weft thread passing over the first,
10 third and sixth warp threads, the third weft thread passing over the second, third and sixth warp threads, the fifth weft thread passing over the third, fourth and sixth warp threads, and the sixth weft thread passing over the third, fifth and sixth warp threads.

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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
P	<u>US - A - 4 161 195 (KHAN)</u> * Column 1, lines 6-43; column 9, lines 27-34; figure 8 *	1	D 03 D 23/00
	-- TOUT LE TISSAGE, vol. IV, by A. Lambrette, published by Les Editions textile et technique Paris, FR. * Pages 4-8; page 36, figure 8; pages 38-45; pages 52-54, (Armures juxtaposées); page 79, (figures) *	1	
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			D 03 D
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document * T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	16-06-1980	BOUJELGIER	